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MINISTRY OF AGRICULTURE, EGYPT

TECHNICAL AND SCIENTIFIC SERVICE

Bulletin No. 7

WORK IN CONNECTION WITH

EGYPTIAN WHEAT.

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PRICE P.T. 1

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MINISTRY OF AGRICULTURE, EGYPT.

TECHNICAL AND SCIENTIFIC SERVICE.

Bulletin No. 7.

(BOTANICAL SECTION.)

WORK IN CONNECTION WITH EGYPTIAN WHEAT,

BY

G. C. DUDGEON, F.E.S.,

CONSULTING-AGRICULTURIST, ETC.

AND

G. BOLLAND,

BOTANIST TO THE MINISTRY OF AGRICULTURE.

(Submitted for printing on March 22, 1916.)

CAIRO.

GOVERNMENT PRESS.

To be obtained, either directly or through any Bookseller, from the GOVERNMENT PRESS, Bulâq ; or from the SALE-ROOM, Old Ismailia Palace, Sharia Qasr el Aini.

1916.

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(BOTANICAL SECTION.)

WORK IN CONNECTION WITH EGYPTIAN WHEAT,

By G. C. DUDGEON,
Consulting-Agriculturist, etc.

Although plant-breeding experiments have been conducted in the Botanical Section of the Ministry of Agriculture from the time of its initiation as a Department, more attention was necessarily demanded in connection with cotton than with any other plant. Cereals with the exception of rice, had never formed an important exported product, and the cultivators and consumers in the country were for the most part content to continue employing the varieties which had served them for a generation or more without significant deterioration with respect to the local requirements. It is true that on two occasions at least during the last two decades, attempts were made to introduce new wheat seed from India, owing to the fact that the seed found in the country had become hopelessly mixed. These introductions perhaps served to re-establish the *Hindi* strain, but did nothing to assist the *Baladi* or country wheat. In 1914, owing to the fact that the flood of the previous year had been a low one and a large area in Upper Egypt was left uncultivated, the Government, anticipating a shortage of seed for the next season, introduced a considerable quantity of Muzaffarnagar wheat, which was distributed on credit to the cultivators. On the whole this wheat did well, but it was found in some parts of the Delta to be severely attacked by rust. The winter of 1914 unfortunately proved a particularly bad one for this disease, and although all varieties were attacked, *Hindi* and the newly introduced Muzaffarnagar seemed particularly susceptible, and suffered more than others. In Upper Egypt, where different climatic conditions prevailed, the new wheat gave most satisfactory results, and was much appreciated by some of the best cultivators who employed it.

Apart from the above introductions of new seed, a systematic and careful study of the existing types of wheat has been commenced in the Botanical Section with a view to elimination of useless or inferior kinds and the establishment of pure strains of those which gave promise of local or exterior commercial value.

The consideration of Egyptian wheat as a possibly marketable product in European countries had to be carefully examined in view of the warnings received from the recurrence of maladies on cotton, against which the peculiar constitution of Egypt rendered it difficult to obtain timely protective legislation. It was necessary to prepare the markets of Europe for the reception of other Egyptian products in case the introduction of a new pest, or the inefficient control of an existing one, should make it impossible to continue to cultivate cotton remuneratively. The European markets knew little of any Egyptian agricultural product except cotton, all others, with the exception of a little rice, which went to Turkey, and beans, which found an occasional demand in Italy and France, being consumed in the country.

With the outbreak of the European War, and the prospect of a reduced demand for cotton at a satisfactory price, the country was recommended to diminish the cotton area and to extend that under cereals, especially wheat. The opportunity of testing the inferences in connection with the value of Egyptian cereals for export made by the writer in 1913, in a paper read before the Congress of the International Association of Tropical Agriculture, had now arrived.

In spite of the fact that it had become a common practice to regard Egyptian wheat as worthless for export, and to refer to the lack of "strength" exhibited in Egyptian flour, actual tests have shown that the contrary is the case. Following the information supplied and the valuations obtained by the Bureau of Commercial Intelligence, directed by the writer in the Ministry of Agriculture, trial consignments were sent to England, which showed that remunerative prices could be readily obtained there. A large amount of assistance in this connection was given by the Imperial Institute, London, whence quotations in British markets and particulars of the various methods of marketing in different British ports were furnished. The Bureau of Commercial Intelligence also obtained opinions concerning Egyptian wheat by direct communication with official and mercantile correspondents in France, Spain, Portugal, Italy, Algeria, and Tunis, and in a short time

an export trade in this product sprang up in some of these countries. The effect onthe country was to maintain wheat at a satisfactorily high figure for the cultivator.

Careful chemical tests made by Mr. Hughes, the Chemist of the Ministry, have shown that "strength," the definition of which is the degree of ability possessed by the flour to produce a well-risen loaf, is exhibited to a considerable degree in most Egyptian flours. In fact, the chief obstacle to the demand for Egyptian wheats in European countries lies in the state in which they are put on the market.

As is well known, Egyptian wheat is chiefly threshed by means of the *nôrag*, a kind of carriage sustained on a number of iron discs, which is drawn by bullocks and driven continuously in circles over the wheat, whereby the grain is removed from the heads, and the straw is at the same time crushed into small flattened flakes, which form the most important summer food for cattle in the country, known by the name of *tibn*. In the process of threshing by means of the *nôrag* it is impossible to prevent small particles of hard earth becoming mixed with the grain, which are difficult to remove by any process of winnowing or sifting. Hence Egyptian wheat, though of good quality, contains a rather large percentage of dirt, which, moreover, during transport becomes pulverized and ground into the grain itself, to such an extent that it cannot be removed by washing, and the milled flour does not therefore acquire the same whiteness as other wheats, which have been threshed by modern machinery.

The *Hindi* wheat of Egypt, which can be considered for practical purposes identical with that shipped from India under the name of "Choice White Karachi," could compete favourably in the English market with the Indian kind, if the same regulations for cleanliness as those which have been enforced in India were made to apply to this country. To attain this position, it would only be necessary to wash all wheat before shipment, and to maintain a greater uniformity in the crops sown. This last is what is at present being attempted in the experiment farm of the Ministry of Agriculture, and an account of the operations conducted during the past year is given in the following report by the Botanist of the Ministry.

It may be of interest in this place to give the figures for exports of wheat from Egypt for the last few years, to indicate with what measure of success the first serious attempts at the establishment of an outside demand have met.

*

Exports of Wheat.

	1912	1913	1914	1915
	Ardebs.*	Ardebs.	Ardebs.	Ardebs.
Great Britain and Mediterranean Possessions	10	—	82	31,676
France and Possessions	3	—	—	33,671
Turkey	9,313	15,605	488	24,828
Tripoli	554	—	—	—
Spain	—	—	20	—
Italy	—	7	—	232,033
Other countries	—	—	—	6,885
TOTALS	9,880	15,612	590	329,093

* An ardeb = 5·444 bushels, the standard weight of which in wheat is 150 kilogrammes. The English ton contains 6·77 ardebs of wheat.

WORK IN CONNECTION WITH EGYPTIAN WHEAT IN 1915,

By G. BOLLAND.

Botanist to the Ministry of Agriculture.

With a view to improving the quality and yield of the wheat grown in the country, very careful selection work has been started in order to separate the various types in the varieties which are at present grown.

After a complete trial of each kind on a sufficiently large scale, pure strains will be propagated which should be better in the quality of evenness, and some also in yield, than the mixture of varieties at present in cultivation.

So far about twenty types have been separated from the ordinary *Baladi* variety, and the following notes give an account of the work done at the Gîza Experiment Farm in 1915, as well as the result of three experiments which were conducted on land belonging to the Gîza School of Agriculture.

Descriptions of the types ultimately selected will be given in a later report.

Cultivation and General Notes.

Sowing took place between November 18 and December 1, 1914. Most of the varieties sown were selections made from the native varieties grown in 1913.

Samples obtained from the following countries were also sown: England, America, Russia, Cyprus, Australia, and the Sudan.

The English wheats had been previously grown at Gîza in 1913, and are very easily distinguished from the other varieties on account of their low habit of growth and large amount of tillering. By reason of their late maturity, the locusts, with which Egypt was visited, destroyed almost the entire crop in April 1915, so that no seed was

saved for sowing in the autumn of 1915. As they were also very badly attacked by "rust," there seems no special object in trying them again.

The Sudanese variety was characterized by an exceptionally long ear, but the crop was destroyed since it was almost entirely covered with "rust."

All the varieties were sown broadcast at the rate of six kêlas per feddân, but the grain from the three best ears of the selected native varieties was also sown thinly in rows. The wheat in the rows was carefully rogued, and the fifty best ears selected and marked with wool. Careful notes of the various parts of the plant, such as the leaf, stem, and ear, were recorded.

At harvest-time most of the varieties were attacked by "rust"; some only very slightly, but others severely. Notes were made with regard to the period of ripening of each kind of wheat.

A belt about one metre wide was marked off round each plot, and the grain kept quite separate at threshing-time.

Reaping was started on April 19, and, when it had been cut, each variety was graded into four lots: best ears, medium ears, small ears, and rogues, each lot being threshed separately. With regard to the belt, however, the last two qualities were eliminated.

The following grades were sown in November 1915:—

1st	=	grain from the special row.	
2nd	=	,, ,,	best ears from the middle of the plot.
3rd	=	,, ,,	medium ,, ,, ,,
4th	=	,, ,,	best ears from the belt of the plot.
5th	=	,, ,,	medium ,, ,, ,,

The grain from each of the selected ears in the special row was kept and sown separate. The results obtained from these will be recorded at the next harvest.

As the plots of the different varieties sown in 1914 were very small, no account was taken of the yield, but four large plots, 264 square metres in area, were sown with the three native varieties and Muzaffarnagar wheat from India in order to test the yields. These last are shown in the following table:—

Red *Baladi* ...	= 10·83	ardebs per feddân.
White *Baladi*	= 10·19	,,
Hindi	= 10·14	,,
Muzaffarnagar	= 10·04	,,

NOTE.—1 ardeb = 5·444 bushels; 1 feddân = 1·038 acres; 12 kêlas = 1 ardeb.

Wheat Experiments at the School of Agriculture, Giza, 1914–1915.

Three different experiments were conducted, namely :—

1. Comparison of yields from different amounts sown.
2. Comparison of the yield of different varieties.
3. Treatment of the seed with varying strengths of copper sulphate and Cyllin for the prevention of "smut."

Each experiment was conducted with a quadruplicate series of plots arranged in chess-board fashion, so that effects due to any differences in soil were practically eliminated.

Experiment 1.—The seed was sown at the rate of four, six, and eight kêlas per feddân, the seed on half the plots being ploughed in, and on the other half harrowed in. The variety of wheat employed in this experiment was in all cases White *Baladi.*

The following table gives the yield of the grain in ardebs per feddân :—

Amount Sown.	Yield of Grain.	Order of Merit.
4 kêlas ploughed in ...	11·45	6
4 „ harrowed „ ...	11·62	4
6 „ ploughed „ ...	11·75	2
6 „ harrowed „ ...	11·89	1
8 „ ploughed „ ...	11·52	5
8 „ harrowed „ ...	11·69	3

From the above it will be seen that the amount usually sown, namely six kêlas, gave the highest yield, and that harrowing the seed in gave a better result than the usual method of ploughing it in. This is accounted for by the better germination of the harrowed-in plots, owing to the soil being more finely broken up. When the seed is ploughed in, a large amount of land is wasted, owing to the big clods of earth which remain unbroken.

Experiment 2.—The varieties tested were Red *Baladi,* White *Baladi, Hindi,* and Muzaffarnagar.

The amount sown in each case was six kêlas per feddân.

The yields were as follows, in ardebs per feddân :—

Variety.	Grain.
White *Baladi*	11·75
Hindi	10·89
Red *Baladi*	10·88
Muzaffarnagar	10·81

Experiment 3.—This experiment was divided into thirty-six plots as follows :—

Untreated...	...	...	...	...	...	...	...	...	...	4	plots.
Treated with	½	per cent	$CuSO_4$	solution				...	...	4	„
„	2	„	„	„				...	...	4	„
„	6	„	„	„				...	...	4	„
„	10	„	„	„				...	...	4	„
„	Cyllin	1 in 2,000		...	...	...	...	...	...	4	„
„	„	1 in 1,000		...	...	...	...	...	...	4	„
„	„	1 in 500		...	...	...	...	...	...	4	„
„	„	1 in 250		...	...	...	...	...	...	4	„

For treatment with the $CuSO_4$, the seed was thoroughly moistened with the solution, while that treated with the Cyllin was left for three hours in the solution.

With regard to the effect on the germination, there was no appreciable difference between the untreated plots and those treated with $CuSO_4$, one-half and two per cent, and Cyllin 1 in 2,000 and 1 in 1,000. But a drop in the germination was evident in the plots which were treated with the stronger solutions, in fact two of the plots, which had been sown with seed treated with Cyllin 1 in 250, had very few plants indeed.

The following table gives the yield in ardebs per feddân for the grain, and also shows the number of diseased ears which were picked out from the different plots between April 21 and 28 :—

Treatment.	Grain.	Number of Diseased Ears.
½ per cent $CuSO_4$ ...	9·71	667
Not treated	9·46	872
2 per cent $CuSO_4$ ...	9·25	556
Cyllin 1 in 500 ...	8·98	417
„ 1 in 1,000 ...	8·85	619
6 per cent $CuSO_4$ ...	8·80	481
Cyllin 1 in 2,000 ...	8·62	687
10 per cent $CuSO_4$ ...	8·08	452
Cyllin 1 in 250	2·37	286

In comparing the number of the diseased ears of the different plots with the untreated plot, it will be seen that both copper sulphate and Cyllin reduce the amount of "smut," and that the stronger the solution the less "smut" is apparent, but that if the solution be too strong, the germination is affected to such an extent that the yield is considerably reduced. From the above table it will be seen that the seed treated with one-half per cent $CuSO_4$ solution gave a higher yield than the untreated seed, due to the smaller percentage of diseased ears in the treated plot. The table also indicates that all the Cyllin solutions were too strong; moreover that a copper sulphate solution stronger than two per cent should not be used, from which it follows that the employment of a ten per cent solution of the latter, which was that previously recommended, is not advisable.

The experiment should therefore be repeated with weaker solutions of Cyllin and with copper sulphate solutions varying in strength between one-half to two per cent.

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